IN THE CLAIMS:

Kindly amend the claims, as follows:

1. (Original) A method of decoding low-density parity-check codes comprising the steps of:

a. calculating $LLrR_{ml}$, for each parity check equation, at iteration *i*-1, in response to step c;

b. decision aided equalizing, at iteration *i*, in response to step a; and

c. calculating $LLrQ_{lm}$, for each parity check equation, at iteration *i* in response to step b,

wherein $LLrQ_{lm}$ represents information from bit node l to equation node m, one for each connection, and

wherein $LLrR_{ml}$ represents information from equation node m to bit node l, one for each connection.

2. (Original) The method of Claim 1, further comprising the steps of:

d. updating, for each parity check equation, the smallest $LLrQ_{lm}$ calculated in step c, at iteration *i*;

e. updating, for each parity check equation, the second smallest $LLrQ_{lm}$ calculated in step c, at iteration *i*; and

f. updating, for each parity check equation, an overall sign of $LLrQ_{lm}$, calculated in step c, at iteration *i*,

wherein step a is responsive to step d, step e and step f, and

wherein step c is responsive to step a.

3. (Currently Amended) The method of Claim 2, wherein step a is calculated as follows, wherein s^i_m comprises a sign of the mth equation:

$$llrR_{ml}^{i-1} = \begin{cases} -s_m^{i-1} \cdot sign\left(llrQ^{i-1}{}_{lm}\right) \cdot min1^{i-1}{}_m, \text{ if } l \neq I_m^{i-1} \\ -s_m^{i-1} \cdot sign\left(llrQ^{i-1}{}_{lm}\right) \cdot min2^{i-1}{}_m, \text{ otherwise.} \end{cases}$$

4. (Currently Amended) The method of Claim 2, wherein step c is calculated as follows:

$$llrQ_{lm}{}^{i} = llrP_l^i + \sum_{m' \neq m} llrR_{m'l}{}^{i-1}$$

wherein $llrP_l$ comprises soft information at iteration *i* in response to step b, one for each bit.

5. (Original) The method of Claim 2, wherein step c is initialized with soft channel information.

6. (Original) The method of Claim 2, further comprising the step of providing indices of each of the parity check equations.

7. (Original) The method of Claim 2, further comprising the step of providing an index of the smallest $llrQ_{lm}$.

8. (Original) The method of Claim 2, further comprising the step of scaling $llrR_{ml}$, calculated in step a.

9. (Previously Presented) The method of Claim 52, further comprising the steps of:

i. summing each of equation syndrome in step h;

j. outputting the hard information if the sum in step i is equal to zero; and

k. repeating steps a-c if the sum in step i is not equal to zero.

10. (Previously Presented) The method of Claim 9, further comprising the steps of:

l. determining if i is less than a first predetermined value;

m. repeating steps a-c, if in step l, i is less than the first predetermined value;

n. determining if the sum in step i is less than a second predetermined value; and

o. outputting the hard information if i is at least the first predetermined and the sum in step i is less than the second predetermined value.

11. (Previously Presented) The method of Claim 10, further comprising the steps of:

p. for each data l, determining if $|llrAPP_l|$ is less than a third predetermined value;

q. for each data l, outputting hard information $b_{c,l}$ if $|llrAPP_l|$ is at least the third predetermined value; and

r. for each data l, outputting soft channel information $b_{s,l}$ if $|llrAPP_l|$ is less than the third predetermined value.

12. (Previously Presented) The method of Claim 11, further comprising the steps of:

s. for each data l, determining if a corresponding parity check equation is violated;

t. for each data l, outputting hard information $b_{c,l}$, if the corresponding parity check equation is not violated;

u. for each data l, determining if $|llrAPP_l|$ is less than a third predetermined value;

v. for each data l, outputting hard information $b_{c,l}$ if $|llrAPP_l|$ is at least the third predetermined value; and

w. for each data l, outputting soft channel information $b_{s,l}$ if $|llrAPP_l|$ is less than the third predetermined value.

13. (Previously Presented) A computer program for decoding low-density parity-check codes comprising the steps of:

a. calculating $llrR_{ml}$, for each parity check equation, at iteration i-1, in response to step c;

b. decision aided equalizing, at iteration i, in response to step a; and

c. calculating $llrQ_{lm}$, for each parity check equation, at iteration i in response to step b;

wherein $llrQ_{lm}$ represents information from bit node l to equation node m, one for each connection, and

wherein $llrR_{ml}$ represents information from equation node m to bit node l, one for each connection.

14. (Previously Presented) The computer program of Claim 13, further comprising the steps of:

d. updating, for each parity check equation, the smallest $llrQ_{lm}$ calculated in step c, at iteration *i*;

e. updating, for each parity check equation, the second smallest $llrQ_{lm}$ calculated in step c, at iteration *i*; and

f. updating, for each parity check equation, an overall sign of $llrQ_{lm}$, calculated in step c, at iteration *I*,

wherein step a is responsive to step d, step e and step f, and

wherein step c is responsive to step a.

15. (Currently Amended) The computer program of Claim 14, wherein step a is calculated as follows, wherein s^i_m comprises a sign of the mth equation:

$$llrR_{ml}^{i-1} = \begin{cases} -s_m^{i-1} \cdot sign\left(llrQ^{i-1}{}_{lm}\right) \cdot min1^{i-1}{}_m, \text{ if } l \neq I_m^{i-1} \\ -s_m^{i-1} \cdot sign\left(llrQ^{i-1}{}_{lm}\right) \cdot min2^{i-1}{}_m, \text{ otherwise.} \end{cases}$$

16. (Currently Amended) The computer program of Claim 14, wherein step c is calculated as follows:

$$llrQ_{lm}{}^{i} = llrP_l^i + \sum_{m' \neq m} llrR_{m'l}{}^{i-1}$$

wherein $llrP_l$ comprises soft information at iteration *i* in response to step b, one for each bit.

17. (Original) The computer program of Claim 14, wherein step c is initialized with soft channel information.

18. (Original) The computer program of Claim 14, further comprising the step of providing indices of each of the parity check equations.

19. (Original) The computer program of Claim 14, further comprising the step of providing an index of the smallest $llrQ_{lm}$.

20. (Original) The computer program of Claim 14, further comprising the step of scaling $llrR_{ml}$, calculated in step a.

21. (Currently Amended) The computer program of Claim ~~13~~ 14, further comprising the steps of:

g. converting $|llrAPP_l|$ information into hard information $b_{c,l}$, wherein $llrAPP_l$ comprises overall soft information after each iteration *i*, one for each bit;

h. calculating an equation syndrome for each parity check equation, s_i.

22. (Previously Presented) The computer program of Claim 21, further comprising the steps of:

i. summing each of equation syndrome in step h;

j. outputting the hard information if the sum in step i is equal to zero; and

k. repeating steps a-c if the sum in step i is not equal to zero.

23. (Previously Presented) The computer program of Claim 22, further comprising the steps of:

l. determining if i is less than a first predetermined value;

m. repeating steps a-c, if in step l, i is less than the first predetermined value;

n. determining if the sum in step i is less than a second predetermined value; and

o. outputting the hard information if i is at least the first predetermined and the sum in step i is less than the second predetermined value.

24. (Previously Presented) The computer program of Claim 23, further comprising the steps of:

p. for each data l, determining if $|llrAPP_l|$ is less than a third predetermined value;

q. for each data l, outputting hard information $b_{c,l}$ if $|llrAPP_l|$ is at least the third predetermined value; and

r. for each data l, outputting soft channel information $b_{s,l}$ if $|llrAPP_l|$ is less than the third predetermined value.

25. (Previously Presented) The computer program of Claim 24, further comprising the steps of:

s. for each data l, determining if a corresponding parity check equation is violated;

t. for each data l, outputting hard information $b_{c,l}$, if the corresponding parity check equation is not violated;

u. for each data l, determining if $|llrAPP_l|$ is less than a third predetermined value;

v. for each data l, outputting hard information $b_{c,l}$ if $|llrAPP_l|$ is at least the third predetermined value; and

w. for each data l, outputting soft channel information $b_{s,l}$ if $|llrAPP_l|$ is less than the third predetermined value.

26. (Original) A decoder for decoding low-density parity-check codes comprising:

first calculating means for calculating $llrR_{ml}$, for each parity check equation, at iteration i-1;

decision aided equalizing means for equalizing $llrR_{ml}$, at iteration i, in response to said first calculating means; and

second calculating means for calculating $llrQ_{lm}$, for each parity check equation, at iteration i in response to said decision aided equalizing means;

wherein $llrQ_{lm}$ represents information from bit node l to equation node m, one for each connection,

wherein $llrR_{ml}$ represents information from equation node m to bit node l, one for each connection, and

wherein said first calculating means is responsive to said second calculating means.

27. (Original) The decoder of Claim 26, further comprising:

memory means for storing for each parity check equation,

the smallest $llrQ_{lm}$ calculated by said second calculating means, at iteration i;

the second smallest $llrQ_{lm}$ calculated by said second calculating means, at iteration i; and

an overall sign of $llrQ_{lm}$, calculated by said second calculating means, at iteration i;

wherein said first calculating means is responsive to said memory means, and

wherein said second calculating means is responsive to said first calculating means.

28. (Currently Amended) The decoder of Claim 27, wherein said first calculating means calculates as follows, wherein s^i_m comprises a sign of the mth equation:

$$llrR_{ml}^{i-1} = \begin{cases} -s_m^{i-1} \cdot sign\left(llrQ^{i-1}{}_{lm}\right) \cdot min1^{i-1}{}_m, \text{ if } l \neq I_m^{i-1} \\ -s_m^{i-1} \cdot sign\left(llrQ^{i-1}{}_{lm}\right) \cdot min2^{i-1}{}_m, \text{ otherwise.} \end{cases}$$

29. (Currently Amended) The decoder of Claim 27, wherein said second calculating means calculates as follows:

$$llrQ_{lm}{}^{i} = llrP_l^i + \sum_{m' \neq m} llrR_{m'l}{}^{i-1}$$

wherein $llrP_l$ comprises soft information at iteration i in response to said decision aided equalizing means, one for each bit.

30. (Original) The decoder of Claim 27, wherein said second calculating means is initialized with soft channel information.

31. (Original) The decoder of Claim 27, further comprising an address generating means for providing indices of each of the parity check equations.

32. (Original) The decoder of Claim 27, wherein said second calculating means provides an index of the smallest $llrQ_{lm}$.

33. (Original) The decoder of Claim 27, further comprising multiplying means for scaling $llrR_{ml}$, calculated by said first calculating means.

34. (Currently Amended) The decoder of Claim ~~26~~ 27, further comprising

slicing means for converting $|llrAPP_l|$ information into hard information $b_{c,l}$, wherein $llrAPP_l$ comprises overall soft information after each iteration *i*, one for each bit; and

equation vector means for calculating an equation syndrome for each parity check equation s_i.

35. (Original) The decoder of Claim 34, further comprising:

summing means for summing each equation syndrome calculated by said equation vector means;

wherein the hard information is output if the sum by said summing means is equal to zero, and

wherein the calculations by said first and second calculating means are repeated if the sum summed by said summing means is not equal to zero.

36. (Original) The decoder of Claim 35, further comprising:

first threshold means for determining if i is less than a first predetermined value,

wherein the calculations by said first and second calculating means are repeated if i is less than the first predetermined value as determined by said first threshold means; and

second threshold means for determining if the sum by said summing means is less than a second predetermined value; and

wherein the hard information is output if i is at least the first predetermined and the sum by said summing means is less than the second predetermined value.

37. (Previously Presented) The decoder of Claim 36, further comprising:

third threshold means for determining for each data l if $|LLrAPP_l|$ is less than a third predetermined value;

wherein for each data l, outputting hard information $b_{c,l}$ if $|LLrAPP_l|$ is at least the third predetermined value as determined by said third threshold means; and

wherein for each data l, outputting soft channel information $b_{s,l}$ if $|LLrAPP_l|$ is less than the third predetermined value as determined by said third threshold means.

38. (Previously Presented) The decoder of Claim 36, further comprising:

judging means for determining for each data l if a corresponding parity check equation is violated;

wherein for each data l, outputting hard information $b_{c,l}$, if the corresponding parity check equation is not violated as determined by said judging means;

third threshold means for determining for each data l if $|LLrAPP_l|$ is less than a third predetermined value;

wherein for each data l, outputting hard information $b_{c,l}$ if $|\text{llrAPP}_l|$ is at least the third predetermined value as determined by said third threshold means; and

wherein for each data l, outputting soft channel information $b_{s,l}$ if $|\text{llrAPP}_l|$ is less than the third predetermined value as determined by said third threshold means.

39. (Original) A decoder for decoding low-density parity-check codes comprising:

a first calculator to calculate llrR_{ml}, for each parity check equation, at iteration i-1;

a decision aided equalizer to equalize llrR_{ml}, at iteration i, in response to said first calculator; and

a second calculator to calculate llrQ_{lm}, for each parity check equation, at iteration i in response to said decision aided equalizer,

wherein llrQ_{lm} represents information from bit node l to equation node m, one for each connection,

wherein llrR_{ml} represents information from equation node m to bit node l, one for each connection, and

wherein said first calculator is responsive to said second calculator.

40. (Original) The decoder of Claim 39, further comprising:

a memory to store for each parity check equation,

the smallest llrQ_{lm} calculated by said second calculator, at iteration i;

the second smallest llrQ_{lm} calculated by said second calculator, at iteration i; and

an overall sign of $llrQ_{lm}$, calculated by said second calculator, at iteration *i*;

wherein said first calculator is responsive to said memory, and

wherein said second calculator is responsive to said first calculator.

41. (Currently Amended) The decoder of Claim 40, wherein said first calculator calculates as follows, wherein s^i_m comprises a sign of the mth equation:

$$llrR_{ml}^{i-1} = \begin{cases} -s_m^{i-1} \cdot sign\left(llrQ^{i-1}{}_{lm}\right) \cdot min1^{i-1}{}_m, \text{ if } l \neq I_m^{i-1} \\ -s_m^{i-1} \cdot sign\left(llrQ^{i-1}{}_{lm}\right) \cdot min2^{i-1}{}_m, \text{ otherwise.} \end{cases}$$

42. (Currently Amended) The decoder of Claim 40, wherein said second calculator calculates as follows:

$$llrQ_{lm}{}^{i} = llrP_l^i + \sum_{m' \neq m} llrR_{m'l}{}^{i-1}$$

wherein $llrP_l$ comprises soft information at iteration *i* in response to said decision aided equalizer, one for each bit.

43. (Original) The decoder of Claim 40, wherein said second calculator is initialized with soft channel information.

44. (Original) The decoder of Claim 40, further comprising an address generator for providing indices of each of the parity check equations.

45. (Original) The decoder of Claim 40, wherein said second calculator provides an index of the smallest $llrQ_{lm}$.

46. (Original) The decoder of Claim 40, further comprising a multiplier to scale $llrR_{ml}$, calculated by said first calculator.

47. (Currently Amended) The decoder of Claim ~~39~~ 40, further comprising

a slicer to convert $|llrAPP_l|$ information into hard information $b_{c,l}$, wherein $llrAPP_l$ comprises overall soft information after each iteration *i*, one for each bit;

an equation vector circuit to calculate an equation syndrome for each parity check equation, s_i.

48. (Original) The decoder of Claim 47, further comprising:

a summer to sum each equation syndrome calculated by said equation vector circuit;

wherein the hard information is output if the sum summed by said summer i is equal to zero; and

wherein the calculations by said first and second calculator are repeated if the sum summed by said summer is not equal to zero.

49. (Original) The decoder of Claim 48, further comprising:

a first threshold detector to determine if *i* is less than a first predetermined value;

wherein the calculations by said first and second calculator are repeated if *i* is less than the first predetermined value as determined by said first threshold detector; and

a second threshold detector to determine if the sum by said summer is less than a second predetermined value; and

wherein the hard information is output if i is at least the first predetermined and the sum by said summing means is less than the second predetermined value.

50. (Previously Presented) The decoder of Claim 49, further comprising:

a third threshold detector to determine for each data l if $|LLrAPP_l|$ is less than a third predetermined value;

wherein for each data l, outputting hard information $b_{c,l}$ if $|LLrAPP_l|$ is at least the third predetermined value as determined by said third threshold detector; and

wherein for each data l, outputting soft channel information $b_{s,l}$ if $|LLrAPP_l|$ is less than the third predetermined value as determined by said third threshold detector.

51. (Previously Presented) The decoder of Claim 49, further comprising:

a judging circuit to determine for each data k if a corresponding parity check equation is violated;

wherein for each data l, outputting hard information $b_{c,l}$, if the corresponding parity check equation is not violated as determined by said judging circuit;

a third threshold detector to determine for each data l if $|LLrAPP_l|$ is less than a third predetermined value;

wherein for each data l, outputting hard information $b_{c,l}$ if $|LLrAPP_l|$ is at least the third predetermined value as determined by said third threshold detector; and

wherein for each data l, outputting soft channel information $b_{s,l}$ if $|LLrAPP_l|$ is less than the third predetermined value as determined by said third threshold detector.

52. (Currently Amended) The method of Claim ~~1~~ 2, further comprising the steps of:

g. converting $|llrAPP_l|$ information into hard information $b_{c,l}$, wherein $llrAPP_l$ comprises overall soft information after each iteration *i*, one for each bit;

h. calculating an equation syndrome for each parity check equation, s_i.